Public Health Lessons Learned From Analysis of New York City Subway Injuries

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Serious subway injuries are devastating to their young victims and have high rates of mortality and amputation. We identified the urban population at greatest risk for subway injuries and investigated the influence of local economies on injury rates. We propose using changes in social conditions as a "trigger" for increased vigilance and protective measures at times of higher risk. (*Am J Public Health.* 2006;96:631–633. doi: 10.2105/AJPH.2004.057315)

Information regarding subway injuries is sparse.[1–14] Most available reports about subway injuries are from Europe, many describing the experience of the London Underground.[8,11,13] Such injuries, defined as those injuries incurred by a person upon contact with any part of the subway train, are devastating, have a high mortality, and most commonly involve young adults, often in the context of underlying psychiatric disease.[3,8,9,12–14] Among survivors, major extremity amputations are common. The cost to the individual and society is enormous; it has been estimated that the direct cost to society of all train-related injuries in the United States may exceed $300 million per year.[5] We identified the population most at risk for subway injuries and hypothesized that changes in local economies are associated with the incidence of subway injuries.

METHODS

Bellevue Hospital Center, is an inner-city Level 1 trauma center, a tertiary referral center for subway and neurologic injuries and microvascular limb replantation, thus preferentially receiving the most severe subway injuries in New York City. The Hospital trauma registry, which utilizes NTRACS software (American College of Surgeons National Trauma Registry System) and emergency room admission logs were retrospectively reviewed for all subway injuries treated at Bellevue from January 1, 1990, to December 31, 2003. Data were blinded, abstracted into an Excel (Microsoft, Redmond, Wash) spread sheet, and analyzed by gender, age, type and extent of injury, mortality, and disposition (Table 1).

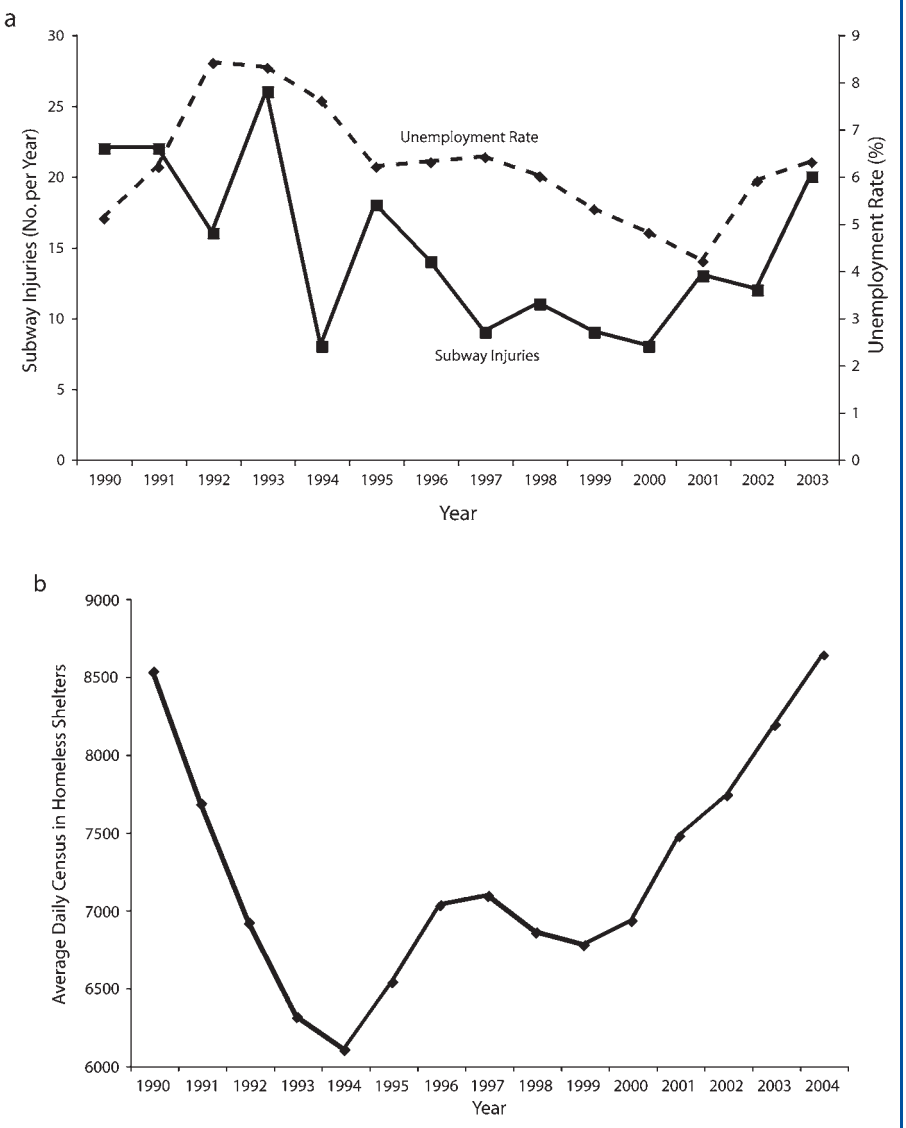
New York City unemployment and homeless rates were used as a measure of the economic status of the city; these data were obtained from the US Department of Labor Bureau of Labor Statistics Data[15] and the Coalition for the Homeless.[16] The number of subway injuries was then plotted against the New York City unemployment and homeless rates for the years 1990 to 2003 (Figure 1).

RESULTS

We reviewed 208 patients who suffered subway injuries (Table 1). Similar to the hospital inpatient trauma population, the majority of patients (80.3%) were male, with an average age of 38.8 years. One

TABLE 1—New York City Subway Injuries Treated at Bellevue Hospital Center: 1999–2003

Data	No. Patients (%)
Demographics	
No. of injuries	208
Mean age, y (range)	38.8 (5–93)
Gender: male	167 (80.3%)
Amputations	
Minor amputations (single finger)	6 (2.89%)
Major amputations (extremity)	38 (18.3%)
Total no. minor/major amputations	44 (21%)
Loss of 1 major extremity	28 (13.5%)
Loss of 2 major extremities	9 (4.3%)
Loss of 4 major extremities	1 (0.5%)
No. major amputations	50
Disposition	
Home (includes discharge against medical advice)	111 (53.4%)
Transfer to rehabilitation facility or psychiatry	73 (35.4%)
Death in hospital	20 (9.6%)



Note. Data are from Bellevue Hospital, New York City, 1990–2003.

FIGURE 1—Economic indicators and subway injuries: number of subway injuries and unemployment rate for New York City (a) and average daily census in New York City homeless shelters (b).

fourth suffered extremity amputations, and 9.6% died of their injuries. Of the surviving patients, 35.4% were transferred to Psychiatry or Rehabilitation Services, whereas 53.4% were well enough for discharge. Additional data were available for the years 2000 to 2003; during that period, 25 of the 56 patients (45.5%) were unemployed, and 14 injuries (25%) were the result of suicide attempts.

The graphs of subway injuries, unemployment rates, and homeless rates reveal a similar pattern with highest rates in the early and late years of our study, and a trough in the years 1994 to 2000, a period when the New York City economy was more robust (Figure 1).

DISCUSSION

There is little published data from the United States discussing subway injuries.[5,10,12] Abroad, other cities have addressed injury prevention in some detail, however,[1–3,6,8,11,14] including reduced public access to subway tracks,[3] increased surveillance by station staff,[1] and restricted media coverage of subway suicides.[11] Each subway system cited above has its own unique risks for passenger injury, whether these represent suicide attempts, interpersonal crime, or true accidents. Many of the interventions described above would not be effective in the New York City subway system because of cost or restraints, such as freedom of the press. Thus, we asked what population-based interventions may work in the United States to reduce the incidence of these devastating injuries. One approach is to identify and target the population at risk.[4]

Like other researchers',[2,14] our findings suggest that the unemployed and the psychiatrically impaired may be at greatest risk for subway injuries and that there may be an association with local economic indicators. Thus, one could argue that dips in the economy should trigger responses by the transit system, including heightened awareness

among law enforcement officers and staff for behavior patterns associated with suicide attempts.[1] However, because this is an ecologic association, additional studies are necessary to clarify the association between economic measures and individual behaviors. An example is the population-based study from New Zealand by Blakely et al.,[17] which linked unemployment to a 2- to 3-fold increase in relative risk for suicide. Such studies could also help inform more practical issues, such as the identification of a threshold unemployment rate at which increased vigilance should be triggered. Furthermore, the role of universal preventive measures should not be underestimated. Changes in platform design,[1,2,6,7] such as those used by the new Air Train rail system in New York City, clearly reduce injury incidence. A simple, less costly modification, which could be easily adapted to the century-old existing stations in New York City, includes the reduction of the speed at which trains enter the station, which could reduce the severity and lethality of injury and allow the motorman more time to recognize a person on the tracks and stop the train before impact.

We have identified a population at risk for subway injury and linked the incidence to local economic forces. We recommend the consideration of economic triggers for increased vigilance—as well as universal precautions—as methods for reducing the incidence of these devastating injuries. ■

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Contributors

A.A. Guth and A.O'Neill originated and designed the article. A.O'Neill acquired the data. A.A. Guth and T. Diflo analyzed and interpreted the data. A.A. Guth drafted the article, and T. Diflo and H.L. Pachter critically reviewed it.

Human Participant Protection

This study was approved by the New York University School of Medicine Institutional Board of Research Associates.

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